

REMARKS

Claims 1-8, all the claims pending in the application, stand rejected. Claim 1 is amended to incorporate the limitations of claim 3, and claim 3 is amended to define additional subject matter.

As a preliminary matter, Applicant is grateful that the Examiner has acknowledged and applied the Applicant's definition of "module" as being the pitch circle diameter in mm divided by the number of teeth.

Claim Rejections - 35 U.S.C. § 102

Claims 1 and 3 are rejected under 35 USC 102 as being anticipated by Tamaki (5,101,784). This rejection is traversed for at least the following reasons.

First, as to claim 1, the claim has been amended to incorporate the limitations of claim 3 therein. Thus, the following arguments apply to original claim 3 and the rejection of claim 1 is moot in view of the amendment of that claim.

Second, as to present claim 3, the rejection is moot in view of the amendment of that claim to recite that the motor is provided with the valve housing in the radial direction of the valve shaft.

The invention of presently amended claim 1 relates to an intake throttle valve apparatus for an internal combustion engine, where the design is compact and adapted for use with engines having a cylinder volume of 1.0 liter or less. In particular, this goal is achieved by implementing a reduction gear mechanism that eliminates an intermediate gear and relies solely upon an output gear that is coupled directly to a motor and meshes with an input gear coupled to a valve shaft. Claim 1, as amended, defines the structure of the intake throttle valve apparatus as relying upon a reduction gear mechanism composed of an output gear and an input gear that directly meshes with the output gear. By implication, this eliminates the intermediate gear. Moreover, the claim now states that the output gear is so mounted on the motor shaft that a gear-tooth portion is distanced from the tip end of the motor shaft in the axial direction.

Tamaki does not disclose the subject matter of amended claim 1, nor does Tamaki have the advantage of the structure defined by claim 1 wherein (1) the number of teeth of the output

gear as well as (2) the module thereof can be decreased or reduced while maintaining the predetermined diameter as well as the predetermined mechanical strength of the motor shaft.

The prior art gear at the location of the gear teeth has a hole centrally formed that permits entry of a motor shaft, as is clear from Fig. 1 of Tamaki. This design necessarily requires the gear to have a larger radius so that sufficient material may be provided around the hole, such that adequate support for the teeth on the gear is provided.

By contrast, the present invention as defined in claim 1 does not have a shaft mounting hole at the location of the gear teeth, but is solid. As is clearly seen in Fig. 2, the shaft mounting hole is to the left of the structure, while the gear teeth supporting portion to the right is solid. This feature is expressly recited in the claim in that it states the gear-tooth portion is distanced (to the right in the Figure) from the tip end of the motor shaft in the axial direction.

The consequence of this feature is that the present invention can reduce the addendum circle or the dedendum circle of the gear, so that number of teeth of the output gear as well as the module thereof can be reduced in comparison to the prior art. The claimed feature is described in the present specification at pages 6 and 7, where the achievement of favorable gear ratios is disclosed.

Claim Rejections - 35 U.S.C. § 103

Claims 2, 5 7 and 8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Tamaki (5,101,784). This rejection is traversed for at least the following reasons.

Claims 2 and 8

Claims 2 and 8 depend from claim 1 and would be patentable for reasons already given with respect to the claim as amended. Moreover, claim 2 specifies a module parameter range and a number of teeth, while claim 8 specifies a gear reduction ratio. These features depend on the unique structure of the invention as defined in claim 1 and are achievable on the basis of that structure.

With regard to claim 2, the Examiner admits that Tamaki does not disclose the module or the number of teeth. The Examiner also admits that the gear reduction ratio is not expressly taught in the prior art. However, the Examiner asserts that it would have been obvious to one skilled in the art to design the gearing arrangement as claimed "because Applicant has not

disclosed that the claim range or reduction ratio provides an advantage, is used for a particular purpose or solves a stated problem.”

The Applicant’s teachings in the specification are clearly contrary to the Examiner’s conclusions in this regard. The teachings specifically demonstrate that a stronger and more durable structure, capable of supporting more teeth and a more favorable gear ratio, is achievable due to the structure of Fig. 2, as defined in claim 1 (amended).

This feature permits the problems in the prior art design to be overcome, particularly for an intake throttle valve apparatus for an internal combustion engine, where the design is compact and adapted for use with engines having a cylinder volume of 1.0 liter or less. This goal is achieved by implementing a reduction gear mechanism that eliminates an intermediate gear and relies solely upon an output gear that is coupled directly to a motor and meshes with an input gear coupled to a valve shaft. In order to effectively control the operation of the valve, the present application teaches specific parameters for the module, number of gear teeth and reduction ratio. Operation outside of that range would lead to ineffective or inaccurate control of the valve. Achievement of those parameters is realized on the basis of the features of the invention as now defined in claim 1, as amended.

In particular, a reduction ratio of the reduction gear train for this arrangement is approximately 10. As explained at pages 5 and 6, the output gear 12 and input gear 13 have a module in a range of 0.4-1.0, with the number of teeth in the range of 4-8 and 70-100, respectively. Also, the interaction distance between the motor shaft 11 and the valve shaft 7 is shortened due to the omission of the intermediate gear. All of these advantages are first taught by Applicant, are achievable due to the structure defined in claim 1, and are not found in the prior art.

Claim 5

With regard to claim 5, the claim would be patentable for reasons given with respect to parent claim 1.

Claim 7

As a preliminary matter, the Examiner refers to Kanazawa et al in his analysis, which appears to be a reproduction of the Examiner’s comments in the previous Office Action. Thus,

it is not clear whether the Examiner is rejecting claim 7 on the basis of Tamaki alone, or Tamaki in combination with Kanazawa et al, or Kanazawa et al alone. Applicants respectfully request a clear statement of rejection in this case and respectfully submit that, if the Examiner does not find Applicant's arguments to be persuasive, the next Office Action cannot be made final as the Examiner's rejection of claim 7 is indefinite.

In any event, the claim would be patentable at least for the reasons given for parent amended claim 1.

Claim 4 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Tamaki (5,101,784) in view of Makino et al (4,690,119). This rejection is traversed for at least the following reasons.

Given the clear differences between the invention of claim 1 and Tamaki, the combination of references should be overcome. Makino et al does not remedy any deficiency in the other prior art.

The Examiner merely asserts that Makino et al discloses a valve apparatus wherein the output gear is fabricated a sintering process (col. 3, lines 42-52). The Examiner does not assert that Makino et al would remedy the deficiencies with respect to original claim 3. Thus, this rejection is overcome.

Claim 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Tamaki (5,101,784) in view of Torii et al (6,626,421). This rejection is traversed for at least the following reasons.

Given the clear differences between the invention of claim 1 and Tamaki, the combination of references should be overcome. Torii et al does not remedy any deficiency in Tamaki.

The Examiner merely asserts that Torii et al discloses a resin based housing. The Examiner does not assert that Torii et al would remedy the deficiencies with respect to original claim 3. Thus, this rejection is overcome.

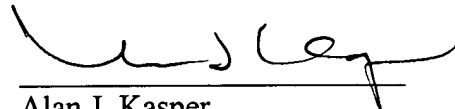
In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the

Amendment Under 37 C.F.R. § 1.111
U.S. Application No. 10/800,721

Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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